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Perceived Correlates of Domain-Specific Physical Activity in Rural Adults in the Midwest

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Abstract

Purpose—In response to calls for more specificity when measuring physical activity, this study examined perceived correlates of this behavior in rural adults separately by the domain in which this behavior occurs (ie, home care, work, active living, and sport).

Methods—A cross-sectional survey was completed by 407 adults from 2 rural towns in the Midwest. The questionnaire assessed the perceived social and physical environment, including neighborhood characteristics, as well as barriers to being active. The Kaiser Physical Activity Survey captured domainspecific activity levels. The response rate was 25%. Multiple regression analyses were conducted to examine the associations between social and physical environment factors and domain-specific physical activity.

Findings—Having a favorable attitude toward using government funds for exercise and activity-friendly neighborhood characteristic were positively associated with active living. Friends encouraging exercise was positively associated with participation in sport. Barriers were inversely associated with active living and sport. Total physical activity was positively associated with workplace incentives for exercise, favorable policy attitudes toward supporting physical education in schools and supporting the use of government funds for biking trails, and it was inversely associated with barriers. There were no factors associated with physical activity in the domains of work or home care.

Conclusions—Correlates of physical activity are unique to the domain in which this behavior occurs. Programs to increase physical activity in rural adults should target policy attitudes, neighborhood characteristics, and social support from friends while also working to decrease personal barriers to exercise.

Keywords

active living; environment; physical activity; rural; social determinants of health

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Rising rates of obesity in rural areas have driven increasing interest in research examining how to prevent or treat this condition.[1,2] A lack of physical activity is one contributing factor to growing levels of obesity.[2] Rural populations have lower rates of physical activity than their urban and suburban counterparts,[3] and rural adults are also less likely to meet physical activity recommendations than adults living in urban or suburban areas.[4] Experts have suggested that one priority of future research should be to identify ways in which the rural environment is related to physical activity,[5] especially as rural areas have unique physical and social environments that may affect health-related behaviors.[6]

Ecological models propose that behavior change can be accomplished through targeting intrapersonal, interpersonal, organizational, community, and public policy factors.[7] Environmental and policy variables can add additional explanatory power beyond that provided by intrapersonal and interpersonal level factors,[8] and evidence suggests that physical and social environment factors may impact the lifestyle choices of physical activity where one lives.[9,10] Studies have shown that neighborhood environment attributes, such as the presence of others being active and physical access to exercise facilities, are linked to physical activity behaviors among rural adults.[4,11,12] While rural adults' physical activity has been found to be positively associated with safety from crime or traffic and the presence of walking trails, less access to facilities and destinations within walking distance and observing fewer people being active in their neighborhoods have been recognized as unique barriers for rural adults to be active.[4,12]

Many studies of physical activity have focused on either total physical activity, or only activities that occur during leisure time.[13] However, physical activity may occur in multiple domains, such as home care or during work-related duties, and correlates of this behavior may differ for each domain.[13] Thus, detailed descriptions of correlates of particular physical activities will help better explain this behavior. Additionally, experts have called for more specificity when measuring factors influencing physical activity,[14] making it necessary to measure physical activity and its correlates separately by each domain in which this behavior can occur. Few studies have examined the rural environment and its associations with physical activity,[13] and much of the relevant literature is somewhat dated, thus indicating a need for more current research in this area.

The purpose of this study was therefore to describe the physical activity occurring in different domains and its associated perceived environmental, social, and policy factors among a sample of rural Midwestern adults. Guided by the multilevel components of a socioecological perspective, it was hypothesized that factors in the social, physical, and policy environments would be positively associated with physical activity, whereas barriers would be inversely associated with physical activity. Rural was defined as a county that does not contain a principal city with 50,000 or more residents.[15]

Methods

Data Collection and Study Population

Data for this study were from an existing cross-sectional study that examined nutrition, physical activity, and other health and social factors in rural adults. More detailed

information on sampling and recruitment for the original study can be found elsewhere.[16] In summary, a survey was administered to adults aged 18 and over from 2 rural communities located in southeastern Iowa. Each community was demographically similar and had a population of approximately 2,300.[16] Individuals were recruited using information from the telephone book, a school contact list, and the county home ownership list. A total of 407 adults participated in the survey, representing a response rate of 25% using eligible persons reached by telephone as the denominator.[16] The participants were more likely than the general population of the state to be older than 45, have a higher income, and to have more than a high school degree.[16] Data on these adults, including height and weight used for body mass index (BMI) calculations, were collected in person at a local church in 2003 by the University of Iowa's Prevention Research Center for Rural Health. For the purposes of this study, data on social, environmental, and policy factors of, as well as barriers to physical activity were used and included in the analysis to test the study hypotheses. Approval from the University of Iowa's Institutional Review Board and Human Subjects Office was obtained before this study was carried out.

Instruments

Perceived correlates of physical activity were measured using a questionnaire developed by Brownson and colleagues.[17] It uses a combination of questions from the Behavioral Risk Factor Surveillance System, the National Health Interview Survey, and other surveys.[18–20] The survey instrument was designed for a national sample of adults, and it includes questions on walking behavior, neighborhood characteristics for and barriers to being active, social assets for being active, community assets for being active, and policy attitudes. This instrument was administered by a trained interviewer to the participants who came in for this study. Moderate to high test-retest reliability was found for most of the questions related to the built environment, and questions related to the social environment showed lower reliability.[5] This questionnaire was reported to have the highest reliability in rural adults among 2 other instruments, with intra-class correlation coefficients ranging from 0.19 to 0.92.[5] Attempts were made to use validated questions when developing the survey; however, no validity values have been reported.[17]

This study focused on sections of the Brownson questionnaire that addressed different levels of influence within a socioecological model, including: social factors (eg, "Do you usually exercise alone or with someone?"); environmental factors (eg, "Do you have access to places to exercise?"); policy factors (eg, "Does your workplace provide support or incentives for you to exercise?"); neighborhood characteristics (eg, "In your neighborhood, are there sidewalks, etc.?"); and barriers to exercise. While previous research has shown that social, physical, and policy factors, as well as barriers, are associated with physical activity in other populations, these variables have not been clearly studied in rural adults among specific domains of physical activity.[4,9,10]

The specific barriers measured in this study included: others discouraging exercise, being self-conscious about one's appearance, afraid of injury, don't have time, too tired, no safe place to exercise, no child care, bad weather, not in good health, don't have energy, get enough exercise at their job, no motivation, and don't like to exercise. The total number of

barriers and the total number of activity-friendly neighborhood characteristics were summed and used in the analysis. Questions on walking behavior were excluded since physical activity was measured in a separate instrument (see below), and the questions on community assets were excluded since a previous analysis showed no associations with these questions and physical activity in rural adults.[21]

The outcome variable of physical activity was assessed using the Kaiser Physical Activity Survey, which was self-administered and captured physical activity across the domains of home care, work, active living, and sport, as well as a summary score of those 4 domains combined. Home care consisted of activities such as child care and cleaning; work addressed perceptions of the intensity of occupational activities; active living included walking and biking; and sport included the most frequent sports (eg, basketball) and exercises (eg, aerobics) participated in during the past year. Each domain was scored on an ordinal scale from 1 to 5 and was calculated by summing the activities of each domain using specified values that indicate categories of intensity or time spent in that activity, and dividing that sum by another specified value.[13] The summary of physical activity across all domains was calculated by adding all of the domain-specific scores together. This survey instrument has been shown to be reliable for measuring women's physical activity in home care and sport ($r = 0.50$ or greater).[22] Active living and work showed lower reliability correlations ($r = 0.22–0.35$). Test-retest reliability values were high (ICC = 0.79–0.85). Examination of the criterion validity of this instrument using accelerometers showed moderate correlations with home care ($r = 0.44$), active living ($r = 0.34$), work ($r = 0.30$), and sport ($r = 0.57$), depending on whether the accelerometer counts were expressed as kilo-calories per day, or metabolic equivalent of task (MET)-minutes per day.[22] This questionnaire was chosen because it assesses physical activity in multiple domains, and it has shown evidence of long-term reliability and moderate validity in adults.[13,23]

Other factors that were examined as covariates included BMI, age to the nearest year, gender, education (10 categories from no schooling to postgraduate degree), and marital status (6 categories including married, widowed, divorced, separated, never married, and live with domestic partner) as these have been shown to be associated with physical activity.[2,14]

Data Analysis

Distributions and frequency counts (means, standard deviations, and proportions) were examined for each variable. The presence and patterns of missing data were examined, and data plots and histograms were examined for outliers. Correlations were examined between independent variables to identify potential co-linearity. Multiple regression models were then built using general linear modeling to examine the associations among the perceived social, environmental, and policy correlates and physical activity in each domain, including the summary score for all of the domains combined. Residuals were examined for the regression models, and goodness of fit tests was conducted. There was no evidence of assumptions being violated and no evidence of lack of fit. All analyses were conducted using SAS (version 9.2, SAS Institute Inc., Cary, NC).

Results

Characteristics of the study population are presented in Table 1. The 407 participants consisted of only non-Hispanic whites, 57% (n = 232) were female, 76% (n = 306) were married, and the mean age was 56 years. In comparison, the state of Iowa is 94% non-Hispanic white and 50.4% female.[24] Due to a lack of variance, the proportion of non-Hispanic whites could not be tested for differences with the state proportion. The proportion of females in the sample was not significantly different from the state ($P = .45$). Approximately 76% (n = 306) were classified as overweight or obese according to their BMI (>25), which is higher than the state average of 63%,[24] but not significantly different ($P = .38$). Men were slightly more likely to be overweight or obese than women (chisquare = 4.3; $P = .038$). Approximately 59% (n = 239) of the sample had attended at least some college. The physical activity scores are also presented in Table 1. Over half of the sample reported walking as their most common form of exercise, and approximately 85% (n = 345) of the sample reported having access to places to exercise. Age was inversely associated with physical activity in all domains.

Tables 2 and 3 present the associations between perceived correlates and physical activity by each domain. No environmental factors were associated with physical activity in the domains of work and home care, and thus results in the text will mainly be presented for the domains of active living and sport.

Physical activity examined in the active living domain was positively associated with having a positive attitude toward using government funds for biking trails ($F = 10.25$; $P < .001$) and a summary score of neighborhood characteristics ($F = 7.12$; $P = .015$), and it was negatively associated with barriers to exercise ($F = 17.49$; $P < .001$). Physical activity examined in the domain of sport was positively associated with friends encouraging exercise ($F = 3.71$; $P = .002$) and negatively associated with barriers to exercise ($F = 41.01$; $P < .001$). Being married was positively associated with physical activity in the sport domain, whereas BMI and age were inversely associated with physical activity in sport.

Factors that were associated with the physical activity summary score across all domains included workplace incentives for exercise ($F = 19.33$; $P < .001$) and supporting physical education in the schools ($F = 3.57$; $P = .047$). The sum total of physical activity was negatively associated with barriers ($F = 8.33$; $P = .004$), and there was an interaction effect of age and supporting government funds being used to build bike trails ($F = 6.85$; $P = .023$), with younger adults supporting the use of government funds to build biking trails.

Discussion

Examining the correlates of physical activity by the domain in which the behavior occurs is unique and fills a need in the literature related to more specificity in measuring the factors influencing physical activity. The findings of this study provide insight into how factors at multiple levels of a socioecological model, including social, environmental, and policy factors, are correlated with domain-specific physical activity among rural adults. Specifically, it was found that physical activity in active living and sport domains are positively associated with the environmental variables of policy attitudes, neighborhood

characteristics, and support from friends. These findings have implications for the development of domain-specific interventions to promote active living and healthy lifestyles for rural adults, guided by an ecological perspective.

Consistent with previous findings,[9,12] this study also found that physical activity in the domain of active living was associated with the overall number of neighborhood community characteristics. Neighborhood characteristics such as sidewalks have been found to influence active living in the form of walking for transportation.[9,12] Physical activity in the domain of sport was not associated with the neighborhood characteristics measured in this study, and thus there may be other environmental features that may play a role in being active in sport within a rural neighborhood. Rural neighborhoods may be less likely to have sport-related equipment, or they may have little or no access to parks nearby where one can participate in sport-related activities.[4] One recent study found that rural parks scored lower than urban parks on access, lighting and safety, and diversity of play equipment,[25] all of which may influence rural adults' involvement in sport in those parks. Future research should examine ways to improve those factors in rural parks, especially as parks may be a source of leisure for rural residents.[26]

Younger persons were found to be more likely to have a positive attitude toward using government funds for biking trails and physical activity. Osuji and colleagues found that support for zoning regulations that included walking or biking paths and using local government funds for improving access to physical activity was also higher in younger persons.[27] Therefore, it can be speculated that younger rural adults may be more amenable to policy-level changes for creating activity-friendly environments using tax dollars, and they could be targeted for support when trying to change policies related to physical activity in rural communities.

There were no social, environmental, or policy factors associated with physical activity in the work and home care domains. In addition, there is a general lack of evidence of environmental factors being associated with physical activity in these domains, suggesting a need for further research in this area. Due to the nature of this secondary data analysis, it was not possible to further explore the types of factors that may be associated with physical activity at work and during home care. Additionally, physical activity done at work or in home care may be more obligatory and determined by other factors than those measured here, such as the nature of one's occupation[2] or the number of children in the home.[28] Future research should use qualitative strategies to examine the types of factors associated with physical activity in these domains.

A lack of association between some of the perceived correlates and physical activity is somewhat surprising, as some of the factors have previously been found to influence physical activity. Social support from friends was found to only influence physical activity in the domain of sport; however, other studies have shown that social support is important for encouraging rural adults to exercise or be active in their daily living.[29,30] Also, positive associations between physical activity and aesthetics of the surrounding environment have been found in rural adults,[12] yet no associations were found in this study.

As expected, perceived barriers to exercise were inversely associated with exercise. Previous research has shown that the most common barriers to exercise in rural adults are no time, no motivation, getting enough exercise at their job, and being too tired.[21,27] In addition, Osuji and colleagues found a dose-response relationship between the number of barriers and the likelihood of not meeting physical activity recommendations among rural women, and they suggest that more research should focus on reducing barriers to exercise in rural populations.[27] Future research could also examine whether there are environmental barriers to exercise which were not captured by the current survey instrument and that are more specific to rural adults, such as the presence of unpaved roads and/or farm equipment on the roads.

Demographic factors that were associated with physical activity included age, BMI and marital status. These findings are supported in the literature.[2,4] Interventions to improve physical activity in rural adults could target older adults, adults with a higher BMI, and adults who are not married or living with a domestic partner. Age was inversely associated with sport, indicating that levels of sport participation drop as one gets older. Further research should explore if this reflects a lack of access to facilities where participation in sports is possible, or whether there is a lack of preference for being involved in sporting activities in rural communities. Education and gender did not have any significant effects, and they were dropped as the reduced models had a better fit. There were no statistically significant differences in perceptions between normal weight and overweight or obese participants on any of the items on the survey instrument, which might be explained by the high proportion of overweight adults in this sample. Although this proportion of overweight adults was not significantly different from the state proportion, it may have influenced some of the results, and it could have clinical significance. For example, physical activity in the domain of sport was inversely associated with BMI.

In regard to the physical activity of the participants, the reported physical activity levels are unit-less, and it is not possible to determine the proportion of those meeting physical activity recommendations from the present data. As a result, these physical activity levels are rank-based and most useful when comparing to other populations. Evenson and colleagues reported a mean overall physical activity score of 9.4 using this same instrument among a sample of overweight or obese postpartum women,[31] which is comparable to the mean score of 9.54 in this study. Domain-specific physical activity scores were also relatively similar between the 2 study samples.

Limitations

The cross-sectional data for this study were collected by self-report, thus limiting the ability to determine casual relationships and being vulnerable to social desirability bias. In addition, this study is limited by the extent to which the findings may be generalized to the whole of Iowa and/or the Midwest. Particularly, the average BMI is lower across the state, and studies in other regions of the state might obtain different results. The survey instruments were designed for a national sample and may not include variables more specific to this population (eg, whether one lives in town or in the country). In addition, the Kaiser Physical Activity Survey instrument assesses this behavior without any units, making interpretation

of results somewhat difficult; however, a higher index score in any domain indicates that an individual participates in more activities and does so more frequently than someone with a lower index score, and the data can be used for ranking purposes.

Conclusions

Recent physical activity research has called for more specificity in outcome variables,[14] and this study provides more clarity on the determinants of physical activity by the domain in which this behavior occurs. Programs designed to increase physical activity in rural adults should address the specific domains of activity, and they should consider the influence of the social, physical, and policy environments, as well as barriers to being active. Future qualitative research in this population could elicit factors more specific to rural areas for inclusion on survey instruments, especially other factors that may exist within multiple levels of influence as guided by a socioecological model.

Additionally, this study provides support for using an ecological approach to increase physical activity in rural adults. Interventions targeting environmental or policy levels are promising because of their potential to influence the behavior of large groups or populations,[7] and there is some evidence for using multilevel interventions to increase physical activity in this population.[32,33] Findings in this study suggest physical activity programs should target policy attitudes, neighborhood characteristics, and social support from friends while also working to decrease personal barriers to exercise. Results of this study of domain-specific perceived environmental, social, and policy correlates perceived by rural adults can be used to tailor specific interventions in that population.

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Table 1

Demographics and Reported PA of Rural Adult Participants

Variable	Number (%)
Women	232 (57.0)
Men	175 (43.0)
Age	
20–39	60 (14.7)
40–49	95 (23.3)
50–59	81 (19.9)
60–69	81 (19.9)
70 and above	90 (22.1)
BMI	
Overweight or obese (25 or greater)	306 (76.3)
Normal or underweight (24.9 or less)	95 (23.7)
Marital Status	
Married	306 (75.6)
Not married	99 (24.4)
Education	
Less than high school	25 (6.1)
High school	143 (35.1)
Some college	133 (32.7)
Bachelor's or higher	106 (26.0)
PA scores by domain	*Mean (SD)*
Overall PA	9.54 (2.46)
Sport	2.71 (1.06)
Homecare	2.27 (0.46)
Work	2.97 (0.72)
Active living	2.62 (0.79)

Table 2

Predictors of Physical Activity in Active Living and Sport Domains

Predictor	Beta	*F* Value	*P* Value	Adj. R^2
Predictors of physical activity in the active living domain (n = 356):				
Barriers	−0.10	17.49	.000	0.13
Supporting the use of govt. funds for bike trails	0.51	10.25	.002	
Summary of neighbourhood characteristics	0.10	7.12	.008	
Predictors of physical activity in the domain of sport (n = 367):				
Barriers	−0.21	41.01	.000	0.19
Age	−0.02	13.88	.000	
Friends encourage exercise	0.44	3.71	.006	
Marital status	1.13	2.67	.022	
BMI	−0.01	4.07	.044	

Table 3

Predictors of Physical Activity Across All Domains (n = 333)

Predictor	Beta	*F* Value	*P* Value	Adj. R^2
Workplace provides incentives to exercise	2.03	19.33	.000	0.32
Barriers	–0.33	8.33	.004	
Age[a] supporting the use of govt. funds for bike trails	–0.04	6.85	.001	
Supporting that schools should have physical education	2.20	3.57	.030	

[a]Interaction effect of age and supporting use of government funds for building bike trails, where younger persons were more supportive of this and were more active across all domains of physical activity.